

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 6,771,553 B2  
APPLICATION NO. : 10/056935  
DATED : August 3, 2004  
INVENTOR(S) : Timothy B. Cowles, Brian M. Shirley and Greg A. Blodgett

Page 1 of 8

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

<u>Column, Line</u>	<u>Reads</u>	<u>Should Read</u>
Column 2, Line 49	"spurious command"	--spurious commands--
Column 6, Lines 1-6	"After the input buffers 110 are enabled by a high IBENCLK signal, the IBENCMD signal transitions high to switch the input buffers 110 to a low impedance state and to turn OFF the transistors 130-136 so they do not affect the at time $T_0$ and registered at time $T_1$ by the rising edge of the external clock CLK signal."	--After the input buffers 110 are enabled by a high IBENCLK signal, the IBENCMD signal transitions high to switch the input buffers 110 to a low impedance state and to turn OFF the transistors 130-136 so they do not affect the operation of the power saving circuit 100. When the input buffers 110 are switched to a high impedance state by a low IBENCLK signal, the transistors 130-136 are turned ON to bias high respective internal command signal lines to which they are coupled. The internal command signals IRAS*, ICAS*, IWE*, and ICS*, as well as other internal command signals from the input buffers 110, are applied to a command decoder unit 140. The command decoder unit 140 generates a plurality of memory commands, including an auto-refresh command

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Page 2 of 8

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<u>Column, Line</u>	<u>Reads</u>	<u>Should Read</u>
Column 6, Lines 1-6 (cont'd)		<p>AREF, from various combinations of the command signals applied to its inputs. As explained above, the AREF command is asserted responsive to decoding IRAS*, ICAS*, and ICS* active low and IWE* inactive high.</p> <p>The auto-refresh command AREF is applied to a refresh decoder 150 along with the internal clock ICLK signal and the internal clock enable ICKE signal. Based on the state of the ICKE signal, the refresh decoder 150 determines if the AREF command is for an auto-refresh or if is for a self-refresh. If ICKE is high, the AREF command is interpreted as an auto-refresh command, in which case the refresh decoder 150 passes the AREF command to an output terminal as an AREF' command. If ICKE is low, the AREF command is interpreted as a self-refresh command, in which</p>

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Page 3 of 8

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Column 6, Lines 1-6 (cont'd)		<p>case the refresh decoder 150 generates a SREF command. The refresh decoder 150 command will continue to generate the SREF command until the ICKE signal transitions high.</p> <p>The AREF command is also applied to a timer 154, which generates a T<sub>OUT</sub> pulse after a predetermined period. The T<sub>OUT</sub> pulse causes the refresh decoder 150 to terminate the AREF' command, thereby terminating the auto-refresh cycle.</p> <p>All of the input buffers 110, 120, 124 as well as the transistors 130-136, the inverter 138, the command decoder unit 140, the refresh decoder 150 and the timer 154, are shown in FIG. 2 as being located in the command decoder 4. However, as previously mentioned, these components could alternatively be located elsewhere in the SDRAM 2 or in other memory devices.</p> <p>The operation of the</p>

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Page 4 of 8

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<u>Column, Line</u>	<u>Reads</u>	<u>Should Read</u>
Column 6, Lines 1-6 (cont'd)		power saving circuit <b>100</b> will now be explained with reference to the timing diagram of FIG. 3. The combination of control signals ("CMD") that constitute an auto- refresh AREF command are applied to the SDRAM <b>2</b> at time $T_0$ and registered at time $T_1$ by the rising edge of the external clock CLK signal.--
Column 7, Lines 14-66	"The operation of the power saving circuit <b>200</b> is substantially the same as the power saving circuit <b>100</b> . Specifically, in response to registering an AREF command, the IBENCMD, IBENADD and IBENCLK signals transition low to disable the input buffers <b>102, 110</b> and the internal clock buffer <b>230</b> . As a result, neither the input buffers <b>102, 110</b> nor circuitry (not shown) downstream from the internal clock buffer <b>230</b> consume power during the auto-refresh cycle initiated in response to the operation of the power saving circuit <b>100</b> . When the input buffers <b>110</b> are switched to	--The operation of the power saving circuit <b>200</b> is substantially the same as the power saving circuit <b>100</b> . Specifically, in response to registering an AREF command, the IBENCMD, IBENADD and IBENCLK signals transition low to disable the input buffers <b>102,</b> <b>110</b> and the internal clock buffer <b>230</b> . As a result, neither the input buffers <b>102, 110</b> nor circuitry (not shown) downstream from the internal clock buffer <b>230</b> consume power during the auto-refresh cycle initiated in response to the AREF

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Page 5 of 8

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Column 7, Lines 14-66 (cont'd)	<p>a high impedance state by a low IBENCLK signal, the transistors <b>130-136</b> are turned ON to bias high respective internal command signal lines to which they are coupled.</p> <p>The internal command signals IRAS*, ICAS*, IWE*, and ICS*, as well as other internal command signals from the input buffers <b>110</b>, are applied to a command decoder unit <b>140</b>. The command decoder unit <b>140</b> generates a plurality of memory commands, including an auto-refresh command AREF, from various combinations of the command signals applied to its inputs. As explained above, the AREF command is asserted responsive to decoding IRAS*, ICAS*, and ICS* active low and IWE* inactive high.</p> <p>The auto-refresh command AREF is applied to a refresh decoder <b>150</b> along with the internal clock ICLK signal and the internal clock enable ICKE signal. Based on the state of the ICKE signal, the refresh decoder <b>150</b> determines if the AREF command is for an auto-</p>	command.--

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Page 6 of 8

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<u>Column, Line</u>	<u>Reads</u>	<u>Should Read</u>
Column 7, Lines 14-66 (cont'd)	refresh or if it is for a self-refresh. If ICKE is high, the AREF command is interpreted as an auto-refresh command, in which case the refresh decoder 150 passes the AREF command to an output terminal as an AREF' command. If ICKE is low, the AREF command is interpreted as a self-refresh command, in which case the refresh decoder 150 generates a SREF command. The refresh decoder 150 command will continue to generate the SREF command until the ICKE signal transitions high. The AREF command is also applied to a timer 154, which generates a T <sub>OUT</sub> pulse after a predetermined period. The T <sub>OUT</sub> pulse causes the refresh decoder 150 to terminate the AREF' command, thereby terminating the auto-refresh cycle. All of the input buffers 110, 120, 124 as well as the transistors 130-136, the inverter 138 the command decoder unit 140, the refresh decoder 150 and the timer 154, are shown in	

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<u>Column, Line</u>	<u>Reads</u>	<u>Should Read</u>
Column 7, Lines 14-66 (cont'd)	FIG. 2 as being located in the command decoder 4. However, as previously mentioned, these components could alternatively be located elsewhere in the SDRAM 2 or in other memory devices. The operation of the power saving circuit 100 will now be explained with reference to the timing diagram of FIG. 3. The combination of control signals ("CMD") that constitute an auto-refresh AREF command are applied to the SDRAM 2 AREF command."	
Column 8, Line 41	"("0" for full AREF period)"	--"0" (for full AREF period)--
Column 8, Line 54	"when the AREF command"	--when the AREF command is asserted--
Column 8, Lines 56 and 62	"to end of the"	--to end the--
Column 10, Line 23	"operable to removing"	--operable to remove--
Column 11, Line 54	"and a detecting"	--and detecting a--
Column 12, Line 37	"transition terminate"	--transition to terminate--
Column 13, Lines 3 and 5	"and decoder"	--and decode--
Column 13, Line 17	"coupled thorough"	--coupled through--
Column 14, Line 64	"coupled thorough"	--coupled through--

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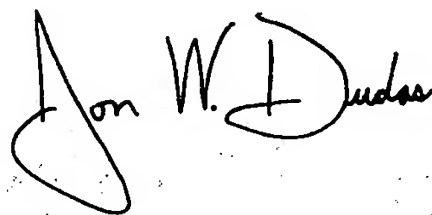
Page 8 of 8

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<u>Column, Line</u>	<u>Reads</u>	<u>Should Read</u>
Column 16, Lines 43 and 46	"decoder"	--decode--
Column 16, Line 59	"and coupled thorough"	--and coupled through--
Column 17, Line 8	"to removing"	--to remove--
Column 18, Lines 3 and 6	"decoder"	--decode--
Column 18, Line 21	"coupled thorough"	--coupled through--
Column 19, Line 22	"claim 63"	--claim 62--
Column 22, Line 4	"claim 89"	--claim 88--

Signed and Sealed this

Tenth Day of October, 2006



JON W. DUDAS  
*Director of the United States Patent and Trademark Office*